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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/802,664	03/09/2001	Rajendra D. Pendse	60084.300301	7522

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EXAMINER

LEE, HSIEN MING

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 03/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/802,664

Applicant(s)

PENDSE, RAJENDRA D.

Examiner

Hsien-Ming Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 March 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 10-17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 18-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 May 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3, 7.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Remarks

1. Applicant's election to claims 1-9 is acknowledged. Claims 18-21 are newly added.

Specification

2. The disclosure is objected to because of the following informalities: on page 1, at "CORSS REFERENCE TO RELATED APPLICATIONS" paragraph, application numbers need to be provided, instead of Atty. Docket number. Appropriate correction is required.

Drawings

3. The formal drawings filed 5/28/02 is objected to because reference numbers pointing to wrong locations. Reference number 34 should be pointed to the second member body, instead of the edge (Fig.3A); and number 46 should be pointed to the plateau of the second member 42, instead of the body (Fig.4A). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-4, 6-9 and 18-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Murakami (US 5,874,780).

In re claims 1-4 and 7-9 Murakami expressly teaches the claimed method for forming a flip chip interconnect structure, comprising:

- providing a first member 107 (bump) on an IC chip 105 and a second member 118 (surface pad having plated finish) on a substrate 101/102, the first member 107 comprising a deformable material (i.e. gold) having a low yield strength and a high elongation to failure and the second member 118 having surface asperities (i.e. concave portion having trapezoidal cross section) on the part to be bonded with the first member 107 (Fig.7A and col.5, lines 14-15; col.6, lines 7-19); and
- pressing the first 107 and the second 118 members against one another using a force sufficient to cause plastic flow of part of the first member 107 into asperities on the second member 118 (Figs 7B-7C).

In re claim 6, Murakami also teaches that the second member 118 is a via opening (i.e. a concave opening as shown in Fig. 7A or a via opening of a mounting pad 103 as shown in Fig.3A)

In re claim 18, Murakami also teaches that a width of the second member 118 (i.e. the width of a bottom 117 of the second member 118 as shown in Fig.7A) is smaller than a width of the first member 107 (i.e. the widest width of 107).

In re claim 19, Murakami further teaches that the second member 118 has a generally trapezoidal shape in transverse sectional view as shown in Fig. 7A, and includes a plateau (i.e. the surface of the bottom 117) having a width smaller than a width of the first member 107 (i.e. the statement in the rejection to claim 18).

In re claim 20, Murakami further teaches that, prior to pressing the first 107 and the second 118 members against one another, dispensing a curable adhesive 109 (i.e. sealing resin) onto a mating surface of the substrate 101/102 (Fig.7A).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (US 780) in view of Yuzawa et al. (US 6,335,568).

Murakami substantially teaches the claimed method, as stated above, but fails to teach that the second member is a lead. However, Murakami further suggests that his teaching is illustrative rather than restrictive and can be modified without departing from the scope and spirit of the invention (col.7, lines 16-19).

Specifically, the lead is a very common and necessary member in semiconductor packaging, wherein the lead (i.e. equivalent to the second member) is usually electrically bonded to the bump (i.e. equivalent to the first member) for forming the interconnecting structure, as evidenced by Yuzawa et al. (col. 5, lines 13-40).

Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to form the flip chip interconnecting structure of Murakami with the first member being the deformable material (i.e. the bump) and the second member being the lead, as taught by Yuzawa et al., since by this manner it would be able to plastically deform the lead and to

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electrically bond the bump for forming the interconnecting structure (col. 5, lines 13-40, Yuzawa et al.).

8. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (US 780) in view of Estes et al. (US 6,189,208).

Murakami substantially teaches the claimed method, as stated above, but fails to teach dispensing a curable adhesive onto a mating surface of the IC chip, prior to pressing the first and second members against one another.

However, Estes et al. in an analogous art of flip-chip mounting teach that it is beneficial to the manufacturing to dispense a curable adhesive (i.e. the adhesive layer) on mating surfaces of two interconnecting members (i.e. chip and substrate), prior to pressing two members against each other for the purpose of eliminating a separate, post-bond underfill step (col.2, lines 1-10).

Therefore, one of the ordinary skill in the art, at the time the invention was made, would have been motivated to adopt the teaching of Estes et al. in the forming method of Murakami to dispense the curable adhesive onto the mating surfaces of IC chip and substrate, prior to pressing the first and the second members against each other, since by this manner it would simplify the manufacturing steps (col.2, lines 1-10, Estes et al).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

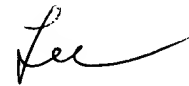
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the

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organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien-Ming Lee
Examiner
Art Unit 2823

A handwritten signature in black ink, appearing to read 'Lee', with a long horizontal flourish extending to the right.

March 15, 2003